

tronic device **1100** can include one or more processors or processing unit(s) **1102**, storage or memory components **1104**, a power source **1106**, a display **1108** (which may display or indicate an operating status, or display the image being projected in an AR/VR system), an input/output interface **1110**, one or more sensors such as microphones, a network communication interface **1114**, and one or more self-mixing interferometry (SMI) sensors **1112**, as described above. Either of the display **1108** or the input/output interface **1110** may include input touch screens, buttons, sliders, indicator lights, etc., by which a user can control operation of the electronic device **1100**. These various components will now be discussed in turn below.

**[0175]** The one or more processors or processing units **1102** can control some or all of the operations of the electronic device **1100**. The processor(s) **1102** can communicate, either directly or indirectly, with substantially all of the components of the electronic device **1100**. In various embodiments, the processing units **1102** may receive the self-mixing interferometry signals from the SMI sensors **1112**, such as self-mixing interferometry signals from any or all of the photodetectors, VCSELs, and other electronics of the imaging and SMI sensors **1112**. Such signals may include those that correspond to the interferometric parameters, and perform any of the methods, or parts of the methods, discussed above.

**[0176]** For example, one or more system buses **1118** or other communication mechanisms can provide communication between the processor(s) or processing units **1102**, the storage or memory components **1104** (or just “memory”), the power source **1106**, the display **1108**, the input/output interface **1110**, the SMI sensor(s) **1112**, the network communication interface **1114**, and the microphone(s) **1116**. The processor(s) or processing units **1102** can be implemented as any electronic device capable of processing, receiving, or transmitting data or instructions. For example, the one or more processors or processing units **1102** can be a micro-processor, a central processing unit (CPU), an application-specific integrated circuit (ASIC), a digital signal processor (DSP), or combinations of multiple such devices. As described herein, the term “processor” or “processing unit” is meant to encompass a single processor or processing unit, multiple processors, multiple processing units, or other suitably configured computing element or elements.

**[0177]** The memory **1104** can store electronic data that can be used by the electronic device **1100**. For example, the memory **1104** can store electrical data or content such as, for example, audio files, document files, timing signals, algorithms, and image data. The memory **1104** can be configured as any type of memory. By way of example only, memory **1104** can be implemented as random access memory, read-only memory, Flash memory, removable memory, or other types of storage elements, in any combination.

**[0178]** The power source **1106** can be implemented with any device capable of providing energy to the electronic device **1100**. For the wearable electronic devices described above, the power source **1106** can be a battery, such as a lithium, alkali, or other type.

**[0179]** The display **1108** may provide an image or video output for certain of the electronic devices **1100**, such as the AR/VR systems described above. The display **1108** can be any appropriate size for a wearable electronic device. The display **1108** may also function as a user touch input surface, in addition to displaying output from the electronic device

**1100**. In these embodiments, a user may press on the display **1108** or gesture toward a portion of the image projected in the AR/VR system in order to provide user input to the electronic device **1100**. Such user inputs may be in addition to the user inputs based on the detection skin deformations and skin vibrations described above.

**[0180]** The input/output interface **1110** can be configured to allow a user to provide settings or other inputs to the various embodiments described above. For example, the electronic device **1100** may include one or more user settable switches or buttons, such as to adjust a volume. The input/output interface **1110** may also be configured with one or more indicator lights to provide a user with information related to operational status of the electronic device.

**[0181]** In addition to the SMI sensors **1112**, the electronic device **1100** may include one or more microphones **1116**, as described in relation to FIGS. 2B-C. Examples of microphones include, but are not limited to, piezoelectric, condenser, ribbon, and other technologies known to one skilled in the art.

**[0182]** The network communication interface **1114** can facilitate transmission of data to a user or to other electronic devices. For example, the network communication interface **1114** can receive data from a network or send and transmit electronic signals via a wireless connection. Examples of wireless connections include, but are not limited to, Bluetooth, WiFi, or another technology. In one or more embodiments, the network communication interface **1114** supports multiple network or communication mechanisms. For example, the network communication interface **1114** can pair with another device over a Bluetooth network to transfer signals to the other device while simultaneously receiving signals from a WiFi or other wired or wireless connection.

**[0183]** Other examples and implementations are within the scope and spirit of the disclosure and appended claims. For example, features implementing functions may also be physically located at various positions, including being distributed such that portions of functions are implemented at different physical locations. As used herein, the phrase “at least one of” preceding a series of items, with the term “and” or “or” to separate any of the items, modifies the list as a whole, rather than each member of the list. The phrase “at least one of” does not require selection of at least one of each item listed; rather, the phrase allows a meaning that includes at a minimum one of any of the items, and/or at a minimum one of any combination of the items, and/or at a minimum one of each of the items. By way of example, the phrases “at least one of A, B, and C” or “at least one of A, B, or C” each refer to only A, only B, or only C; any combination of A, B, and C; and/or one or more of each of A, B, and C. Similarly, it may be appreciated that an order of elements presented for a conjunctive or disjunctive list provided herein should not be construed as limiting the disclosure to only that order provided. Further, the term “exemplary” does not mean that the described example is preferred or better than other examples.

**[0184]** The foregoing description, for purposes of explanation, used specific nomenclature to provide a thorough understanding of the described embodiments. However, it will be apparent to one skilled in the art that the specific details are not required in order to practice the described embodiments. Thus, the foregoing descriptions of the specific embodiments described herein are presented for pur-